

Chapter 7 Structural Sheets

OVERVIEW

DETAILING TO SCALE

Introduction

We'd like to make it as easy as possible to draw our structural details. The biggest problem we face in doing this is the issue of controlling text and dimension size relative to plot scale. To make sure we're always drawing 1:1 (full size), we've adopted a workflow that relies on MicroStation's built-in use of reference files, as well as a heavily customized *Settings Manager*.

File Segregation

Let's look at an abutment as an example of how we're going to segregate files. Say we have three sheets for abutment one: a footing sheet, an abutment sheet and a wing sheet. In our bridge\msta\ folder for this project, we will have one .dgn file that corresponds to each of these sheets. They might be named "016_abutment1.dgn" "017_pier_1.dgn" and "018_framing.dgn." These files would be empty except for a border that contains the title block, signature block, etc. All of the detailing work that we've done for this abutment will be other files, which might be called "z_abut_1.dgn", "z_pier_1.dgn" and "z_framing.dgn." These files contain the lines, text and dimensions that make up our details.

Creating A Detailed Drawing

The first step in detailing our abutment is to create the drawing file that is going to contain our lines, text and dimensions.

✓ Refer to page 1-12 for *Creating Drawing Files*.

Now we are ready to do our detailing work. We will discuss this in detail elsewhere, but for now, note that we will be using the *Settings Manager* to control our level, color, style and weight. From the *Settings Manager*, select **Structural Detailing > Abutments** and draw up your abutment plan.

Now it's time to decide what scale we're going to want to plot this plan. Until we have placed text or dimensions on this plan, we can plot it out at any scale. It is the size of text and dimensions that lock us down to a fixed plot scale.

If your *Settings Manager* is docked at the bottom or top of your screen, right-click on it to pop up the menu choices (Figure 7-1).

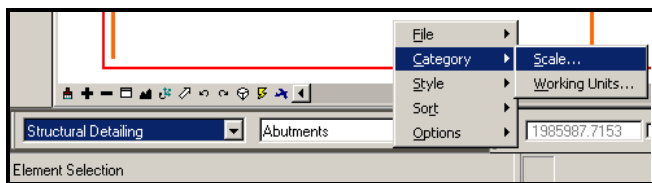


Figure 7-1: Right Click on your *Settings Manager*

From the menus, select **Category > Scale** to select the working scale for your detail. This brings up the **Select Scale** dialog (Figure 7-2).

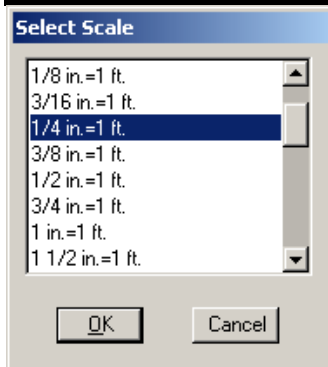


Figure 7-2: Select Scale

Let's select a scale of $\frac{1}{4}$ in. = 1 ft. and push **OK**.

✓ Check page 2-23 for more information on the Settings Manager Scale.

Once you have selected your scale, it is time to annotate your detail. Using the **Prop. Text and Dims > Dimension Ft./In. (1/4 accuracy)** (Figure 7-3), this will setup your dimension sizes and your text size. Finish up your detailing work.

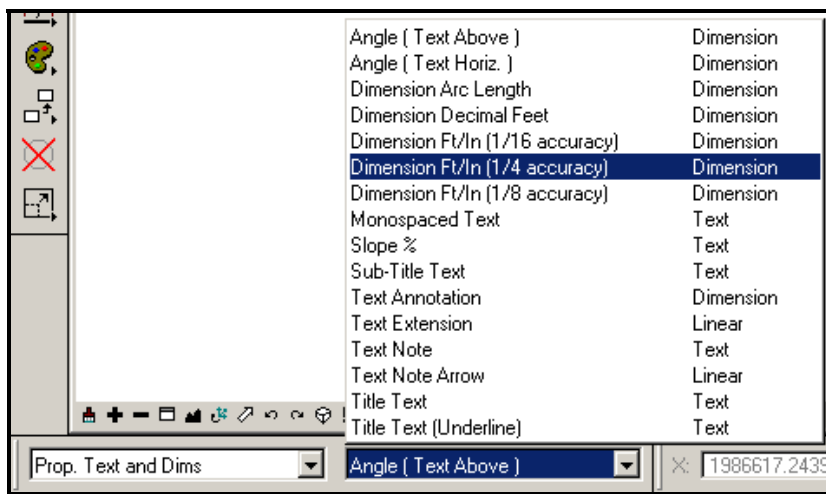


Figure 7-3: The Prop. Text and Dims Group

Once you have finished your annotation, we are going to set up a *Saved View* that contains our detail. From the *Settings Manager*, choose **Tools > Saved View Maker**.

This will run a macro to quickly create a saved view for you. It will prompt you to enter the lower left and upper right hand corners of a box that contains all of the lines and text that make up your detail (Figure 7-4).

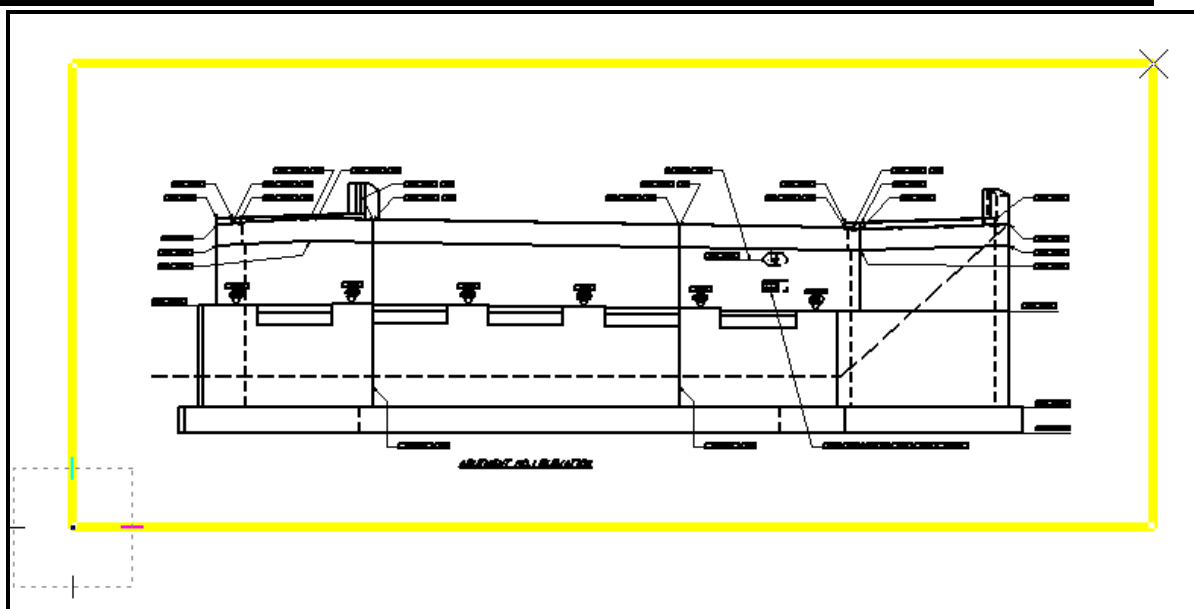


Figure 7-4: Define the Extents of your Saved View

Once you enter in both of these points, the macro will then resize your open window to the aspect ratio of your detail and open up a **Saved View** dialog to ask you for a name and a description of your view (Figure 7-5).

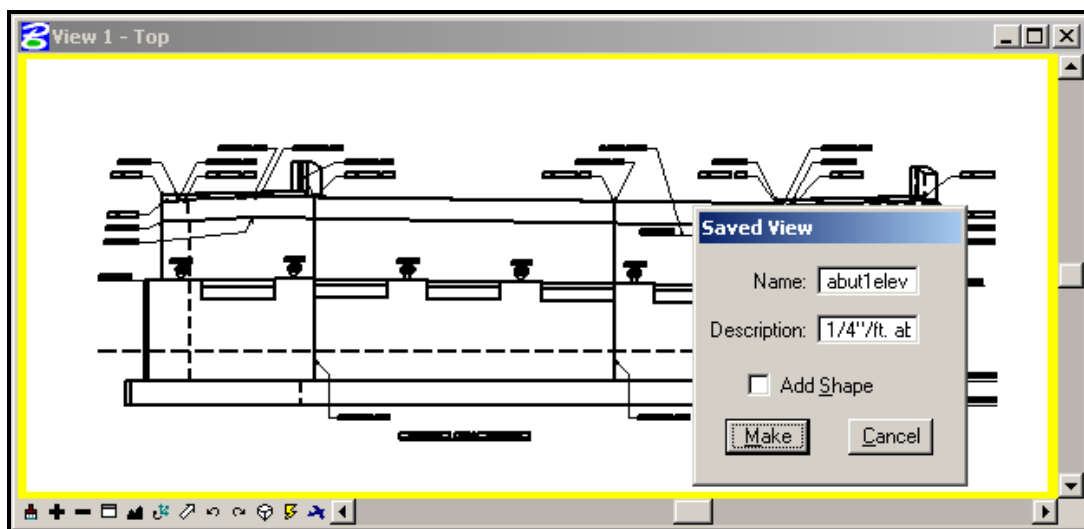


Figure 7-5: Naming a Saved View

🎵 In the description field, make sure to include a reference to the scale of the detail, as you will need that information later.

This completes the work that needs to be done in this file. Now we are going to create a Sheet File and attach our detail to it.

Creating a Numbered Border File

✓ Refer to page 1-12 for creating your Border File

mdot MicroStation

Structural Sheets

Fill in the information in the border by selecting **Macros > Border Information** from your main menu.

♪ If you find the information on your border to be incorrect then it will be necessary to edit your “Project Configuration File”. This can be accomplished by going to the main menu and selecting **Workspace>Edit Project Data (PCF)**.

✓ *Refer to page 1-19 for more information about PCF Editing.*

Now it's time to attach our detail to this drawing. Select **File > Reference (DOT) > Attach**.

This will bring up the **Preview Reference** dialog (Figure 7-6).

Select your drawing file and push **OK**.

♪ Using this selection instead of the out-of-the-box **File > Reference** allows us to go directly to the project directory that we are working in and keeps us from having to browse to the directory.

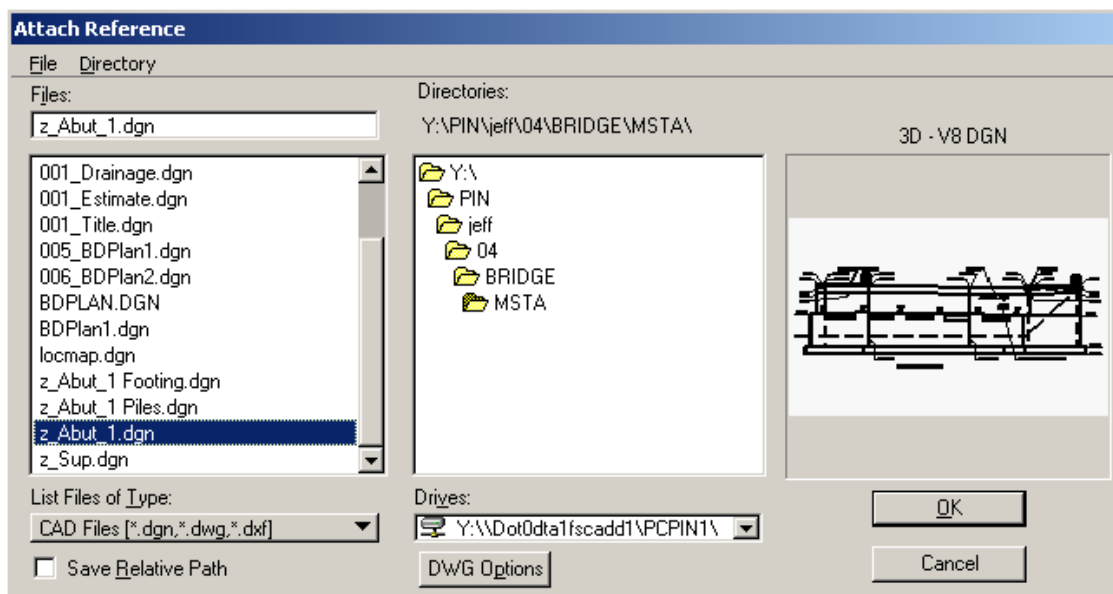
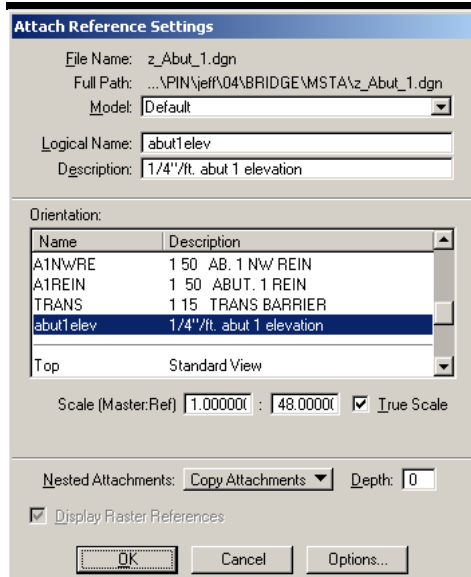


Figure 7-6: The Preview Reference Dialog

This will bring up the **Attach Reference File** dialog (Figure 7-7).



Attach Reference Settings

File Name: z_Abut_1.dgn
 Full Path: ...\\PIN\\jell\\04\\BRIDGE\\MSTA\\z_Abut_1.dgn
 Model: Default

Logical Name: abut1elev
 Description: 1/4"/ft. abut 1 elevation

Orientation:

Name	Description
A1NWRE	1 50 AB. 1 NW REIN
A1REIN	1 50 ABUT. 1 REIN
TRANS	1 15 TRANS BARRIER
abut1elev	1/4"/ft. abut 1 elevation
Top	Standard View

Scale (Master:Ref) 1.00000 : 48.0000 ☒ True Scale

Nested Attachments: Copy Attachments Depth: 0

☒ Display Raster References

OK Cancel Options...

Figure 7-7: The Attach Reference File Dialog

We will need to make a number of selections here. First off, pick your saved view from the **Orientation** portion of the dialog. When picking a *Saved View* you will notice that the *Logical Name* and the *Description* will fill in automatically. Finally, set your **Scale (Master:Ref)** to be equivalent to the *Settings Manager* scale that you used when annotating your detail. (In this case, our 1/4 in.=1 ft. *Settings Manager* scale translates to a 1:48 Master:Ref scale.) Push **OK**.

✓ Refer to page 16-2 for the table of U.S. Customary detailing scales.

This will dump you back into your file with a box hovering on the end of your cursor (Figure 7-8).

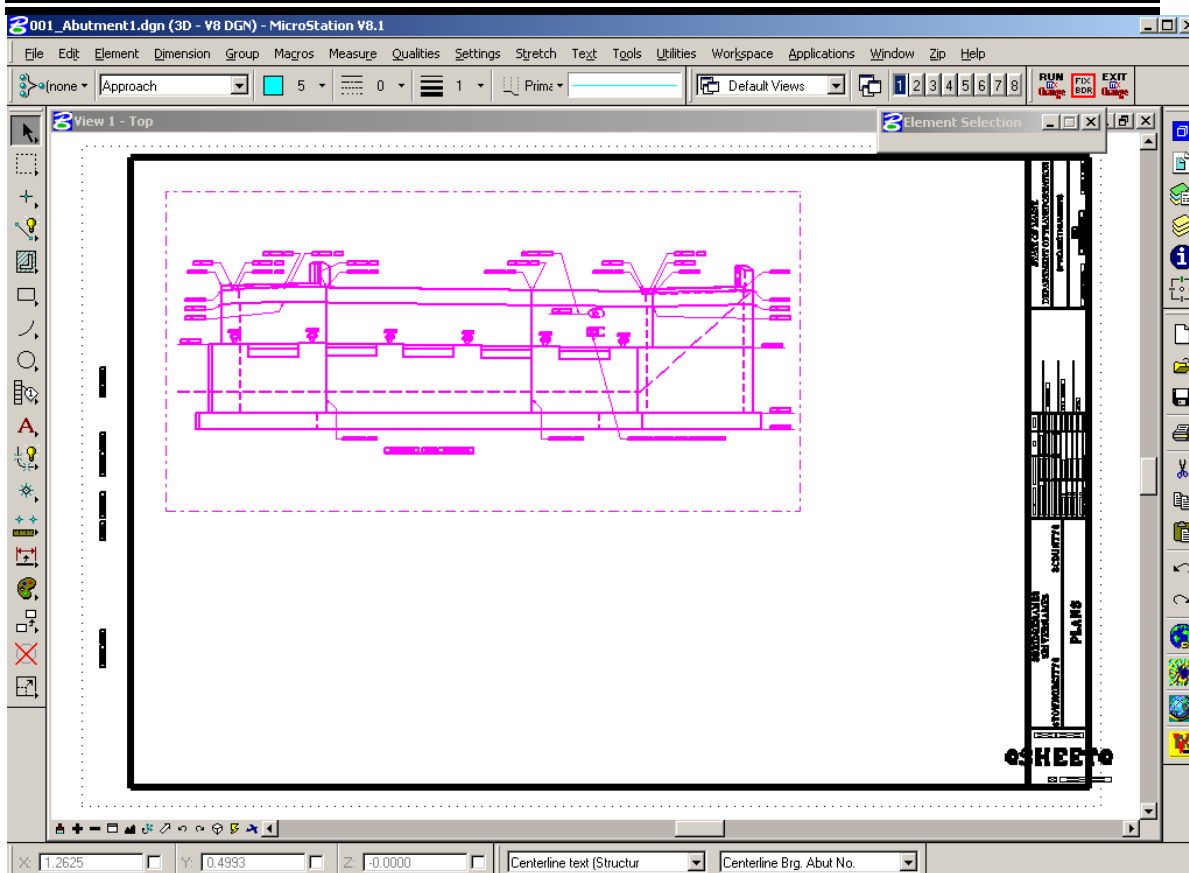


Figure 7-8: Reference Placement by Saved View

Datapoint somewhere on your border to place your detail in an acceptable location.

Adding Further Details, Different Scales

To continue with the previous example, you might go back into your `z_abut_1.dgn` and create an abutment elevation. Since the abutment plan and elevation may be at the same scale, you should have no trouble working on both of those details in the same file for the life of the project. You would set up a saved view for the elevation and attach that saved view to your `017_abutment1.dgn`. Then any changes that needed to be made to those two sections would be made by opening up `z_abut_1.dgn` drawing file.

However, the abutment section is often at a different scale than the plan and elevation. There are two choices for detailing this section. One method would be to create a new design file ("`z_abut1_sect.dgn`") and choose something like " $1/2\text{in.}=1\text{ ft.}$ " for the scale. Then draw and annotate as we just explained, creating a saved view and attaching that file to `017_abut1_plan.dgn`.

The other method would be to draw the abutment section in the same file as the abutment plan and elevation. Then, when you wanted to place text on the section, you would choose " $1/2\text{in.}=1\text{ ft.}$ " as you *Settings Manager* Scale and reselect **Prop. Text and Dims > Dimension Ft./In. (1/4 accuracy)** to establish the correct dimension and text size for annotating your section detail.

♪ Remember, this won't affect the text that we've already placed on the $\frac{1}{4}$ in.=1 ft. details. It only impacts text that we are going to place from here on out.

The only drawback to this method arises when you want to add more annotation to the $\frac{1}{4}$ in.=1 ft. details. You **MUST** select the proper *Settings Manager* Scale before using the *Settings Manager* to place additional text, dimensions, custom linestyles, or cells. This means that as you work on this drawing you will need to continually flop back and forth between scales.

To check your current *Settings Manager* scale, go to the *Settings Manager* and choose **Tools > Plot Scale?** (Figure 7-9)

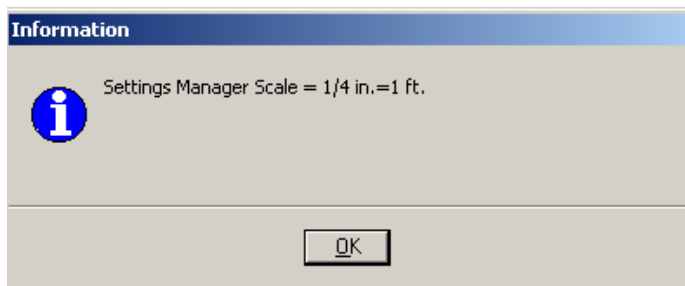


Figure 7-9: Settings Manager Scale Information

TOOLS IN THE SETTINGS MANAGER

The **Tools** section of the **Settings Manager** (Figure 7-10) has a couple useful automation routines.

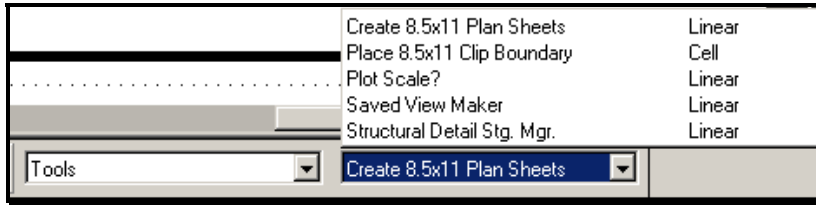


Figure 7-10: Settings Manager > Tools

The File Making Macros

File creation has been removed from the Structural Settings Manager. Cut sheets will be created from the **USPlan Settings Manager** and all other file creation will be handled through the **makesheetz.bas** macro (**File > Makesheetz**).

- ✓ Check page 1-12 for a description of the makesheetz macro.
- ♪ There is a file creating process within the Tools group that allows for developing 8.5 x 11 detail sheets for the purpose of developing Coast Guard permit plans. This works very similar to creating plan sheets. You would use the option Place 8.5x11 Clip Boundary around your specific details and then process them to sheet drawings by using the option Create 8.5x11 Plan Sheets.

Plot Scale

The **Plot Scale?** Component reminds you of your current **Settings Manager Plot Scale** (Figure 7-11).

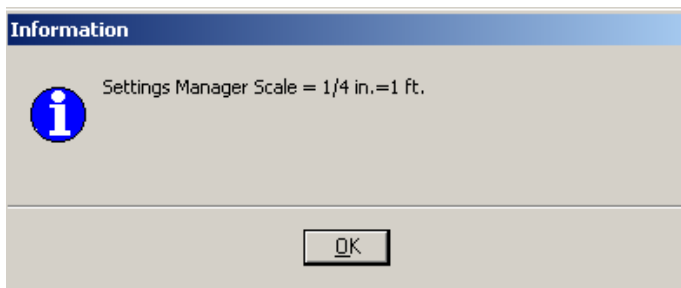


Figure 7-11: Settings Manager Scale Information

Make Saved Views

The **Saved View Maker** is a way of automatically creating a *Saved View* of a specific size and aspect ratio.

Saved Views are a little bit like bookmarks in a MicroStation .dgn file. They help you get back to a specific location in your file by storing the coordinates in a utility called **Saved Views**.

The default way of accessing *Saved Views* is by opening the dialog from the Menus under **Utilities > Saved Views** (Figure 7-12).

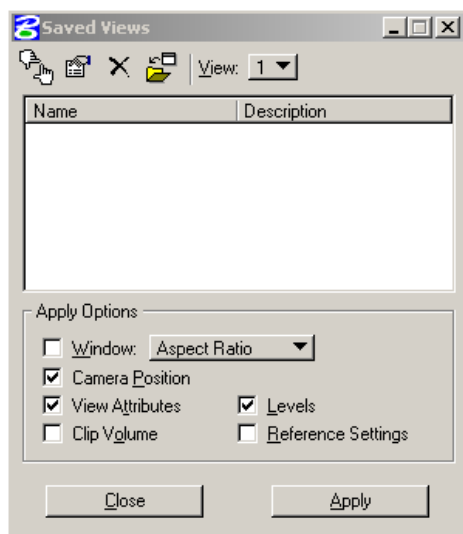


Figure 7-12: Saved View Dialog

Structural Detail Settings Manager

When selecting **Structural Details Stg. Mgr.** you will launch another *Settings Manager* that will allow you to place structural detail cells that have been built into a cell library for you. They are categorized by bridge components.

- ♪ If there are any details that you develop while detailing that would be pertinent to be created as cells please contact your support staff to develop and make them accessible to all others.

DIMENSIONS AND THE SETTINGS MANAGER

Angle (Text Above)	Dimension
Angle (Text Horiz.)	Dimension
Dimension Arc Length	Dimension
Dimension Decimal Feet	Dimension
Dimension Ft/In (1/16 accuracy)	Dimension
Dimension Ft/In (1/4 accuracy)	Dimension
Dimension Ft/In (1/8 accuracy)	Dimension
Monospaced Text	Text
Slope %	Text
Sub-Title Text	Text
Text Annotation	Dimension
Text Extension	Linear
Text Note	Text
Text Note Arrow	Linear
Title Text	Text
Title Text (Underline)	Text

*Figure 7-13: Dimensions***Dimensions With Arrows**

There are currently four options for placing Dimensions with Arrows.

- **Dimension Decimal Feet** lays out dimensions to hundredths of inch accuracy.
- **Dimension Ft/In (1/16 accuracy)** lays out dimensions to a 1/16" accuracy.
- **Dimension Ft/In (1/4 accuracy)** lays out dimensions to a 1/4" accuracy.
- **Dimension Ft/In (1/8 accuracy)** lays out dimensions to a 1/8" accuracy.

Selection of any of these options will setup your active level, color, style and weight, as well as setting an appropriate dimension text height for your active **Settings Manager Scale**. It will also launch the appropriate tool for dimensioning (in this case, the *Dimension Size Arrow* tool (Figure 7-14).)



Figure 7-14: Dimension Size Arrows Command

Angle (Text Above) & Angle (Text Horiz.)

These Components set us up for dimensioning the angle between two lines. The **Text Above** option places the text in-line with the dimension arc. The **Text Horizontal** option cuts the dimension arc and always draws in text horizontal (Figure 7-15).

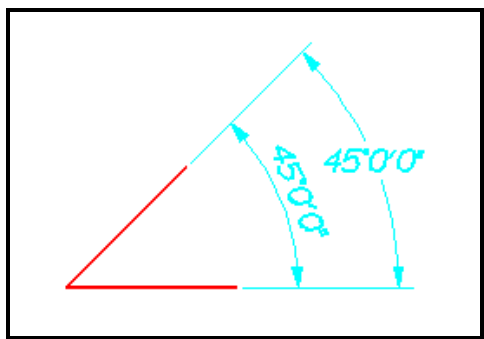


Figure 7-15: Angular Dimension Examples

- 🎵 This command can be used to dimension obtuse as well as acute angles, depending on the order in which you identify the lines. In the pictorial, I identified the horizontal line first, and then the slanted line and I got the angle that was less than 180°. This is because

MicroStation always dimensions angles in a *counter-clockwise* direction, if I had identified the slanted line first, I would have gotten the angle that was greater than 180°.

Dimension Arc Length

This tool allows for dimensioning an arcs length with a radial dimension (Figure 7-16).

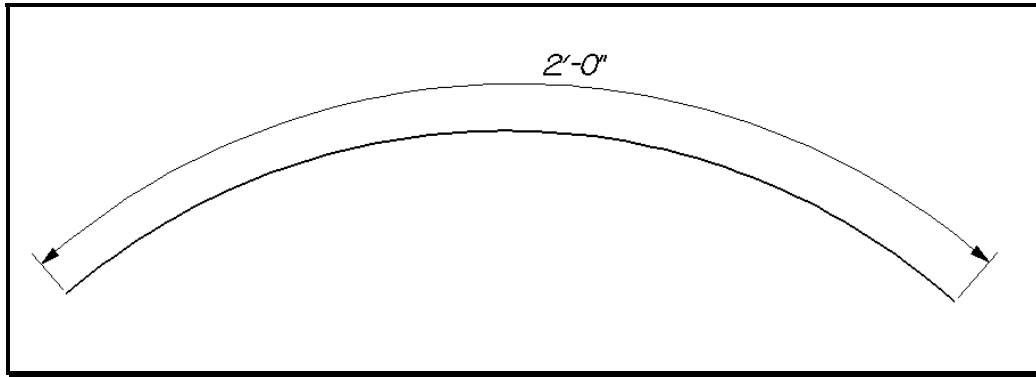


Figure 7-16: Dimension Arc Length

STRUCTURAL DETAILING AND THE SETTINGS MANAGER

The **Structural Detailing** component of the **Settings Manager** (Figure 7-17) is set up to help us control level, style, color, and weight of elements that we place on our drawings as we draw details.

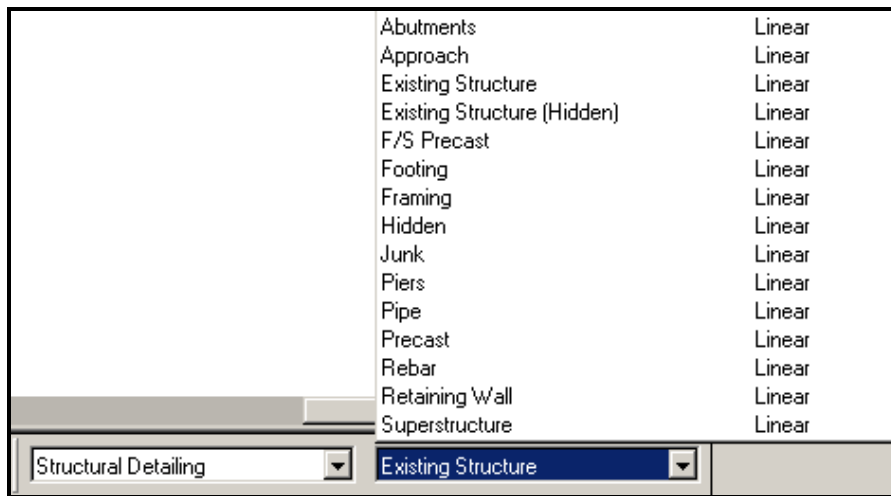


Figure 7-17: Structural Detailing Settings Manager

Nuts and Bolts

Selecting any component from the **Structural Detailing** portion of the *Settings Manager* does a number of things.

Most of the components set you active color, level, style and weight. You can watch these attributes change on your **Attributes** tool box (Figure 7-18).

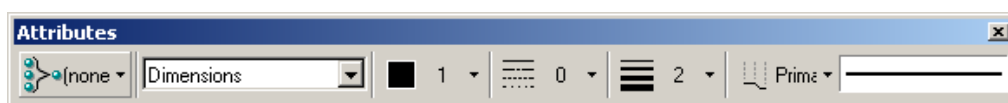


Figure 7-18: The Primary Tool Box

The only exception to this is the **Hidden** component, which only changes your style to dotted and weight to thin. (This allows you to draw a **Hidden** line of any of the other types: **Abutment**, **Framing**, etc.)

Some Typical Uses

New Elements:

Probably the most common workflow will be simple. Decide what kind of detail you're working on. See which *Component* best corresponds to the work you're going to be doing, and pick that item from the **Settings Manager**. This will set up the proper *Symbology* and level for you.

♪ *Symbology* is MicroStation's collective term for color, style and weight.

Now choose your drawing commands (place circle, place *Smartline*, etc.) and start drawing.

Changing Existing Elements:

You'll also use the **Structural Detailing Group** for cleaning up elements that may have been drawn wrong. Maybe you constructed lines parallel to a centerline, and now you need to change them to an **Abutment** style.

From the **Settings Manager**, choose **Structural Detailing > Abutments** to set the appropriate level, color, style and weight.

Then, choose the *Change Attributes* tool either from the **Main Tool Frame** or from the Menus (**Qualities > Change > All**). This will prompt you to *Identify Element*. Pick the element that you want to change. (Make sure to *Accept* the change by entering a *Datapoint*.)

Adding New Detailing Types

If there is a detail type that you think needs to be added, please bring it to the attention of your support group.

CHANGING DETAIL SCALE

So you've finished drawing up your detail. You've got it all dimensioned. You've got it all annotated. Now you've changed your mind about what scale you need to use, and all your text, dimensions, and linestyles look wrong.

No Quick Solution

There's no one-step program to fixing this problem. It's going to take some work. But here are the things you need to do:

Scale

First off, let's make sure you pick your new scale. From the **Settings Manager**, choose **Category > Scale** and pick your new scale (Figure 7-19).

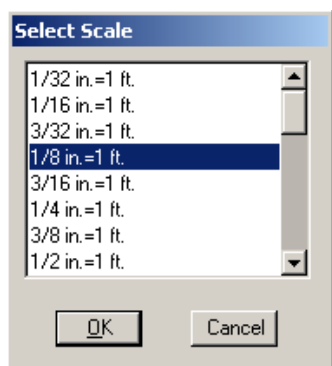


Figure 7-19: Pick a Settings Manager Scale

✓ Check page 2-23 for more information on the Settings Manager Scale.

Text

Now let's get the text out of the way. You've already got a lot of text on the drawing; you just need to change it. We're still going to start by going to the **Settings Manager** and choosing **Prop. Text and Dims > Text Note** (Figure 7-20).

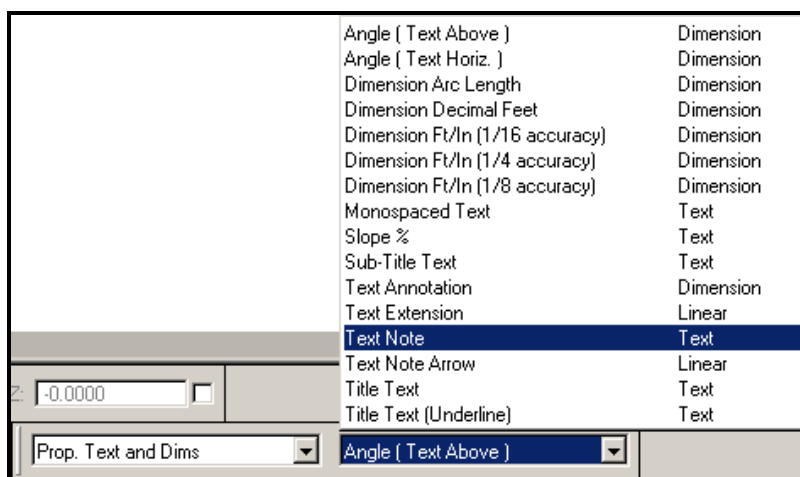


Figure 7-20: Structural Settings Manager

This will open up the **Text Editor** (Figure 7-21).

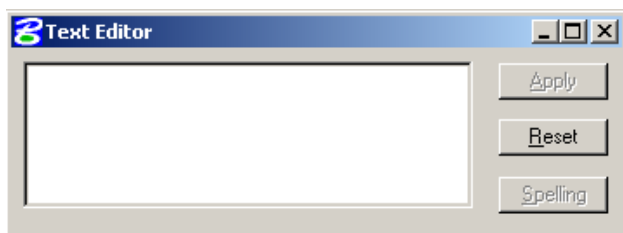


Figure 7-21: The Text Editor

It opens up because that *Component* launched the *Place Text* command. We're not going to use the *Place Text* command, however. Go to your Main Menu and choose **Text > Update Text**. (This is the same as the **Change Text Attributes** command (Figure 7-22) from the **Text** tool box.).

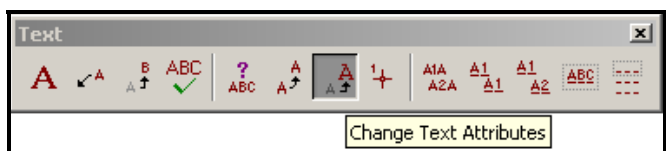


Figure 7-22: Change Text Attributes

This tool is used to change the *Text Attributes* of an existing text item. The status bar will prompt you to "Identify Element." Go around your detailing, picking on all the text that needs to be changed. Or, if you prefer, place a fence that encompasses all of the text items that you want to change and check off the **Use Fence** option in your **Tool Settings Window**. This will let you change a whole bunch of text items at once.

Once that's done, you're going to notice that some of the text doesn't fit into spaces where it used to fit, or text will overlap other text or parts of the detail. This is going to require some cleanup. I recommend the Main Menu **Zip > Move** to move text items back into place. Make sure to use *Accudraw* to keep them in proper horizontal and vertical alignment.

Dimensions

We're going to use a similar procedure for all the dimensions that need to be changed. First, go to the **Settings Manager** and choose the dimension *Component* that corresponds to the dimension that you need to change.

Once you have selected a *Component*, MicroStation is going to launch a *Place Dimension* command. We're going to ignore that command and go on to select *Update Dimension* either from the **Dimension** toolbox (Figure 7-23) or from the Main Menu **Dimension > Update**.



Figure 7-23: The Dimension Toolbox

This command works very similar to the *Change Text Attributes* command. It will prompt you to identify a dimension to change. Go around your detail, picking on every dimension

that needs to be updated to your current settings. Note that there is no way to change a fence full of dimensions at once. However, you can use the *Element Selection* tool or the *Powerselector* to pick a whole bunch of dimensions, and then issue the *Update Dimension* command to change the whole lot of them.

Linestyles

The last thing that needs to be changed may not be obvious at first. Your Arrow and Bullet linestyles should always be the same size relative to your text. So if your text size changes, you should make sure to change your linestyles as well.

Do this by going to the **Structural Linestyles** Group from the *Settings Manager* and picking the linestyle that you want to update (Figure 7-24).

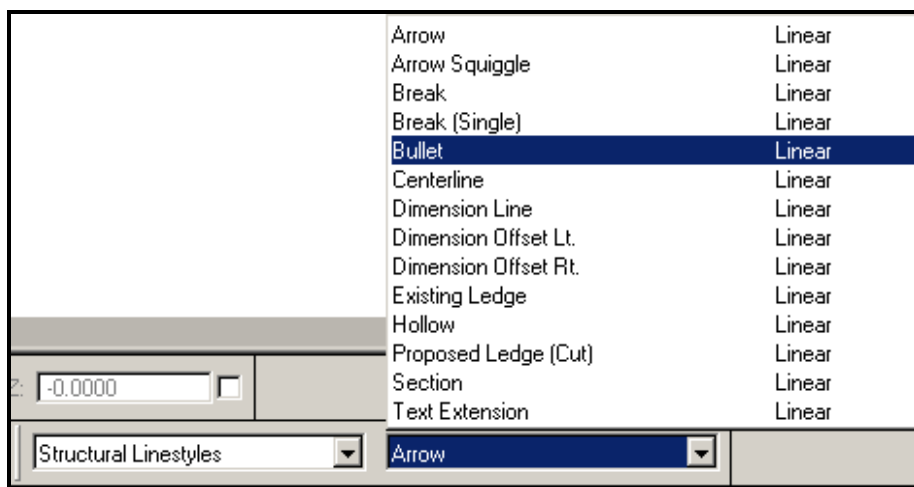


Figure 7-24: Structural Linestyles

This will set your active settings appropriately. It will also issue the *Place Smartline* command. Again, we're going to ignore the command launched by the *Settings Manager* and go on to select *Change Element Attributes*.

This can be selected from the **Main Tool Frame** or from the Main Menu **Qualities > Change > All**. Now identify each line that needs to be changed.

Speeding up the Process

It is possible to use the *Select By Attributes* command from the **Edit** menu (Figure 7-25) to speed up the process of selecting elements that need to be changed.

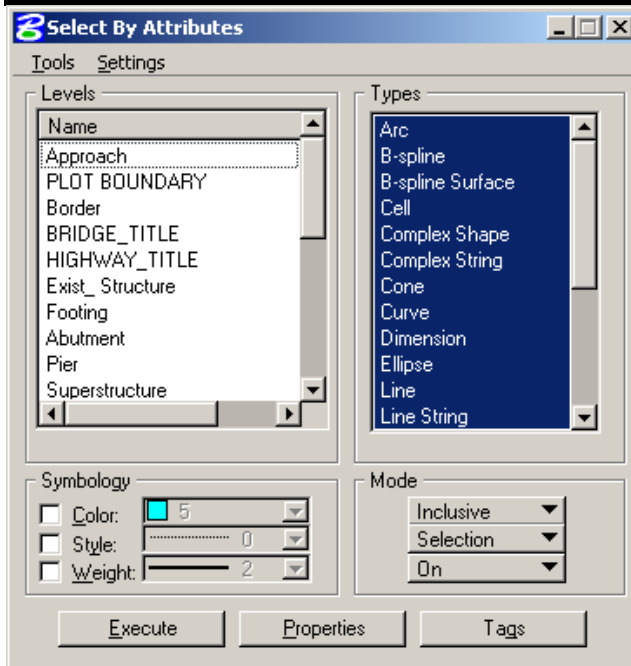


Figure 7-25: Select By Attributes

This utility allows you to select elements by Level, Symbology, and Type (Line, Arc, etc.)

✓ Refer to page 2-33 for a thorough discussion of Selecting by Attributes.

TEXT AND THE SETTINGS MANAGER

One of the primary functions of the *Settings Manager* is to help us control text size on details of various scale. We have programmed a number of text settings into the *Settings Manager*. They are accessed through the **Prop. Text and Dims Group**.

A Word on Scale

Before you place text on a detail, make sure that you have determined what scale you want that detail plotted at. Make sure you have selected that scale from the *Settings Manager* by choosing **Category > Scale**.

✓ Check page 2-23 for more information on the *Settings Manager Scale*.

Text Components

There are basically four different types of text we'll be placing on our drawing. All of our annotation will be done with the **Text Note** option. This sets up our standard normal text size and activates the text placement command. The other text size options are the **Title Text** options: **Title Text** and **Title Text (Underlined)** and the **Sub-Title Text**.

♪ It is no longer necessary to underline text by drawing a line underneath it. MicroStation will automatically underline text for you. If you are going to place a detail label, make sure to use the **Underlined** option.

There may be cases where you want larger text that is not underlined, and that is where the **Title Text Component** comes in, also you may find an instance where you want a text size that falls between our standard normal size and the title text size. This is when the **Sub-Title Text** option would be handy.

Behind the Scenes: The Long Way Around

What are these *Components* really doing for you? They are setting up text attributes like font, height and width. To see the changes that are made when you select the text *Components*, open up the **Text Dialog** by choosing **Element > Textstyles** from the Main Menu (Figure 7-26).

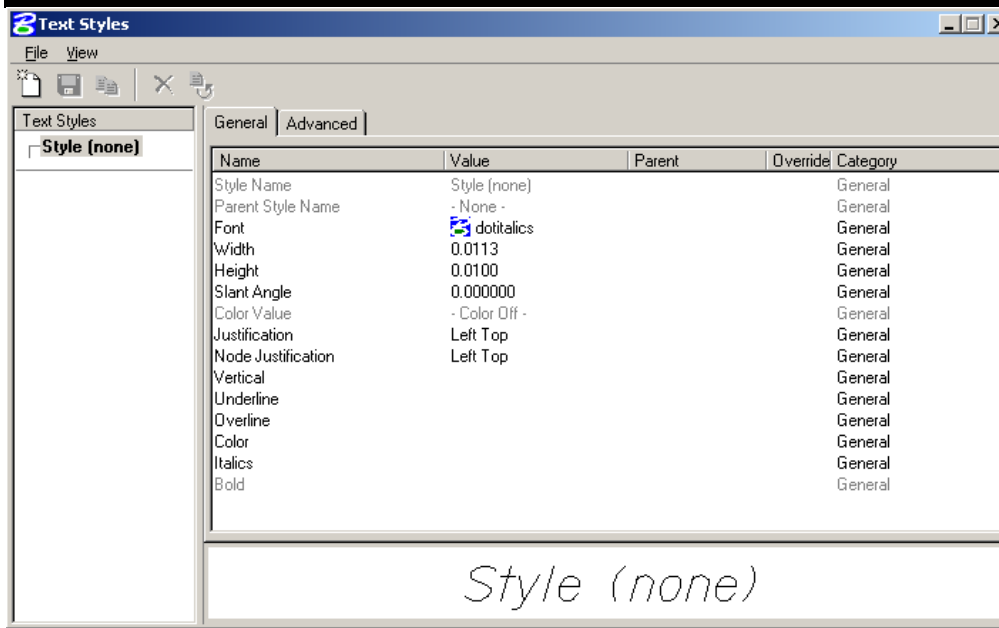


Figure 7-26: The Text Styles Dialog

Placing Text Annotation

Much of the text that we're going to be placing on our drawings is going to be in the form of annotation: a label with an arrow or bullet that extends to a detail. We have decided to approach this matter as simply as possible. First, place your text around your detail. Then, from the **Settings Manager**, select one of the **Text Note** linestyles (like **Text Note Arrow**).

- 🎵 Selecting the **Note/Linestyle** component does two things. First off, it sets your active color, style, weight and level -- just like the **Structural Detailing Component**. Second, it runs the *Place Smartline* command.

MicroStation is now ready to help you draw a leader line from your text to your detail. Use *Accudraw* and your snaps to control the geometry of the leader line (Figure 7-27).

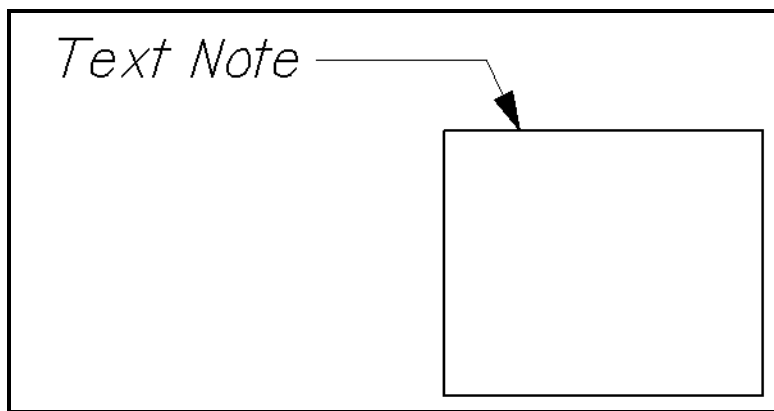


Figure 7-27: Sample Leader Line

Some Difficulties

First off, you can't snap to text in a very useful way for placing notes. The only points you can snap to on text are the origin, the center, and the midpoint. These probably aren't going to help you locate the perfect spot to start placing your leader lines. This means eyeballing is the answer.

Changing Your Mind About Scale

If you change your mind about the scale that a detail is going to be, it's going to screw up your text. There's no way around it.